
ISDN QSIG Path Replacement

ISDN QSIG Path Replacement allows an active connection through an ISDN QSIG private network to be replaced with more efficient connection. Path replacement service is invoked by the following triggers:

- QSIG Call Diversion (QSIG Call Diversion redirects Call Forwarding Busy, Call Forwarding No Reply and Call Forwarding Unconditional calls to another set over a QSIG network)
- Network congestion on the first Private Integrated Service Network Exchange (PINX) node

Note: Private Integrated Service Network Exchange (PINX) may be used interchangeably with Private Branch Exchange (PBX).

- Detection that the connected number differs from the called number

QSIG Path Replacement does not directly attempt to reduce the number of trunks involved in a call. This feature attempts to replace non-optimum paths across a QSIG network with an optimum path. The optimum path between to PINX nodes is the path which takes the first choice route to all PINXs. The optimum path is not set up until the terminating set answer the call.

ISDN QSIG Path Replacement uses the following replacement mechanisms: triangulation and anti-tromboning. These are described in more detail beginning on page 461.

QSIG Path Replacement is permanently active on the PINX. This service is triggered internally or externally by another PINX. QSIG Path Replacement can be invoked on a mixed network of QSIG and Non-QSIG (such as MCDN). Path replacement uses the PINX_DN in the Customer Data Block as a rerouting number. Only QSIG interfaces are optimized. The Meridian Defined Customer Network (MCDN) is not optimized.

The section that follows discusses the use of Private Integrated Service Network Exchange (PINX) DN's as part of the Path Replacement feature.

ISDN PINX DN

The Path Replacement feature must scan the PINX nodes to find the optimum path to a remote PINX node. To accomplish this trunk optimization function, Path Replacement makes non-call associated requests (D-Channel messages only, no B-Channels are used) to the Path Replacement feature at the remote PINX node. The requests are not directed to any existing DN on the remote PINX node, but to a processing function on that PINX node.

To be able to route those types of calls through the network from one originating node to a destination node, an ISDN PINX DN must be defined for each PINX node in the network.

The ISDN PINX DN is a DN taken from the customer's numbering plan used to aid with the routing of network calls. It does not correspond to a real terminal on the node, so it is never busy. The ISDN PINX DN uses the same number of digits as the numbering plan; either UDP or CDP. It is defined so that the Path Replacement feature on a distant node can make non-call associated calls to the Path Replacement feature on another node when no particular destination exists. Those calls are made using existing routing configurations, e.g. a CDP distant steering code or a UDP location code expecting a fixed number of digits. For example, the far end PINX node has a digit sequence composed of the steering code plus the ISDN PINX DN with the same length and digit sequence used to route normal calls from the distant node to the local node for CDP type calls and location code plus a 4 digit ISDN PINX DN for UDP type calls.

One ISDN PINX DN should be configured per network location. This ISDN PINX DN is used for the Path Replacement feature and other features such as Electronic Lock Network Wide/Electronic Lock for Private Lines and Call Pickup Network Wide features.

No user or feature other than Path Replacement, Electronic Lock Network Wide/Electronic Lock for Private Lines and Call Pickup Network Wide features will be allowed to dial the ISDN PINX DN. If a user dials this DN, they will receive overflow tone.

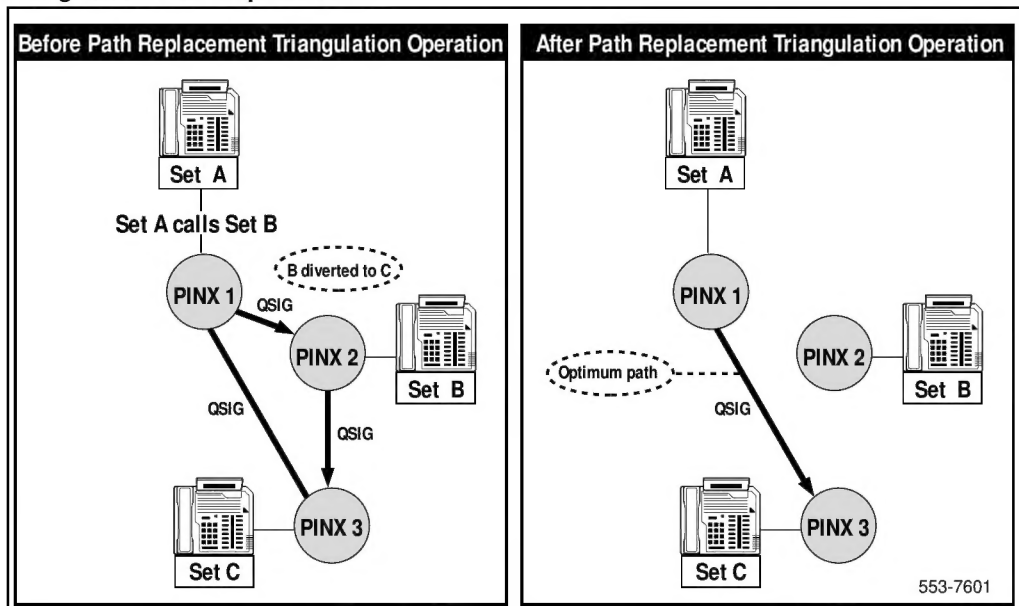
Triangulation Path Replacement

With Triangulation Path Replacement, either the originating or the terminating node involved in a QSIG call recognizes that a call is using a non-optimum path due to call diversion, network congestion or detection of a different number than dialed. If this call is still ringing, the originating/terminating node will wait for an answer signal before initiating triangulation path replacement. If the call is established, then replacement can be performed immediately.

The ISDN QSIG Path Replacement feature replaces non-optimum paths across a QSIG network with optimum paths. An optimum path between two nodes is the first choice route at all nodes. This feature does not attempt to reduce the number of trunks involved in a call but does attempt to locate the optimum path.

As shown in Figure 39, Set A on PINX 1 calls Set B on PINX 2. Set B has activated Call Forward All Calls to Set C on PINX 3. Trunk optimization occurs between PINX 1 and PINX 3. Trunks between PINX 1 and PINX 2 and PINX 2 and PINX 3 are torn down after the call is answered by Set C.

Figure 39
Triangulation Path Replacement

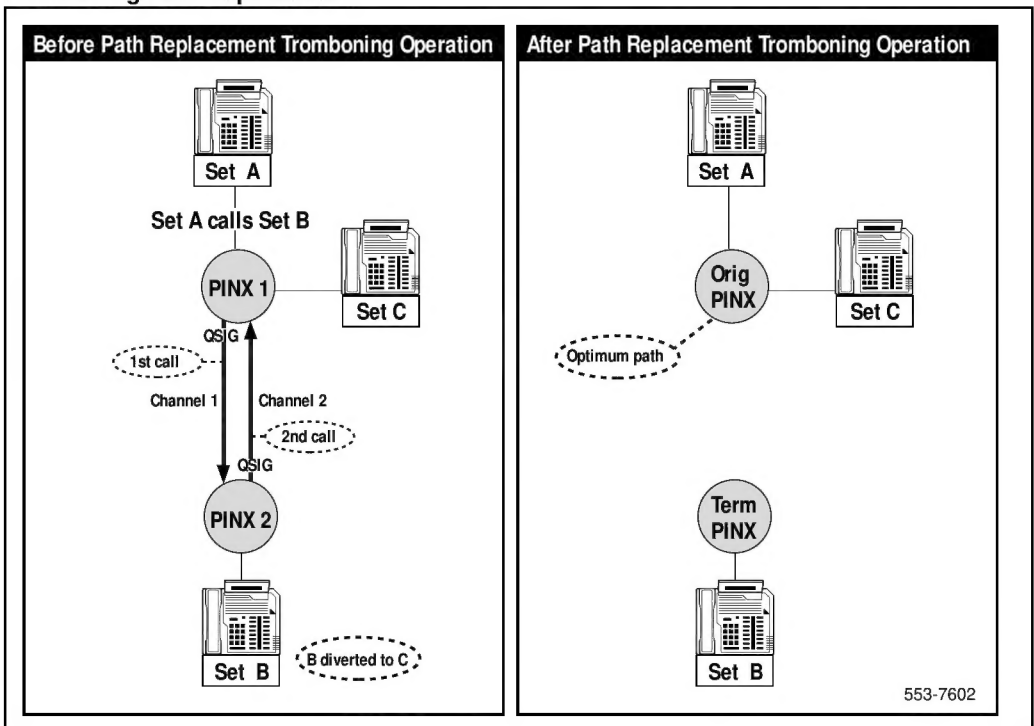


Anti -Tromboning Path Replacement

This feature performs anti-tromboning replacements to eliminate any dual parallel trunking that are caused by call modification. Anti-tromboning path replacement is only invoked after the divert-to caller answer the call. Anti-tromboning is only performed when all the trunks are associated with the same customer.

As shown in Figure 40, Set A on PINX 1 calls Set B on PINX 2. Set B has activated Call Forward All Calls to Set C on PINX 1. Anti-tromboning occurs between PINX 1 and PINX 2 and these trunks are torn down after Set C answers the call.

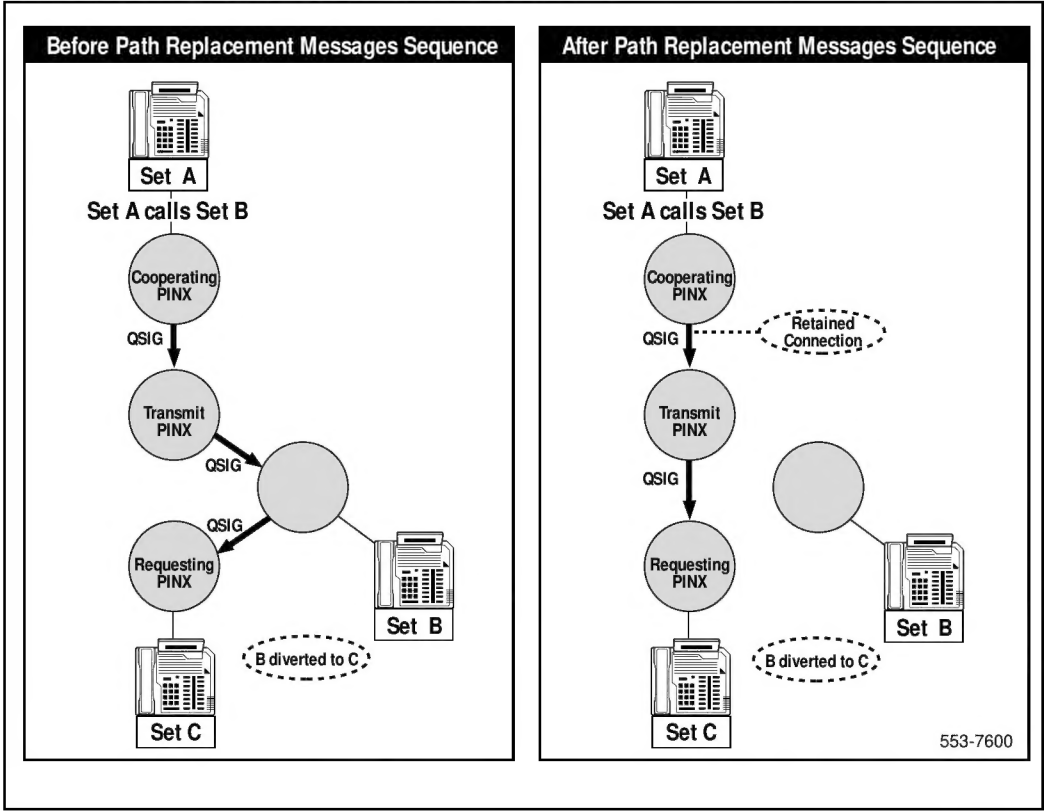
Figure 40
Tromboning Path Replacement



Retaining Path Replacement

When path replacement has been invoked, the cooperating PINX determines whether or not to retain part of the original connection provided that the original connection used the optimum route to reach the re-routed number. As shown in Figure 41, the connection between the cooperating and transit PINX is retained after path replacement has occurred.

Figure 41
Path Replacement Retaining Part of Old Connection



Operating parameters

Network congestion occurs when a non-optimum path from the first PINX node is detected.

When call diversion is not supported by a PINX node, path replacement is triggered when the connected number differs from the called party's number.

ISDN QSIG Path Replacement requires the Multi-Serial Data Link (MSDL) card. This feature is only supported on Coordinated and Uniform Dialing Plans. Route Access Codes are not supported. Digit manipulation is not supported.

If a path replacement request is triggered and fails with the cause "invalid Rerouting Number" the request is discontinued. No attempt is made with another rerouting number.

When a call has several triggers for path replacement and the first trigger fails, no other attempts are performed using the other triggers. Path replacement triggers are chosen according to the following order:

- 1** QSIG Call Diversion
- 2** Congestion on the first PINX
- 3** Different Connected Number

The configuration of diversion and connected number triggers can generate a lot of path replacement collisions if the QSIG Call Diversion feature is configured on the QSIG network. In this situation, it is recommended that only the diversion trigger be configured. This establishes the optimized call in the same direction as the originating call.

New traffic reports are generated for QSIG Path Replacement. TSF009 reports traffic activity for D-channels and TFS011 reports traffic activity for Multi-purpose ISDN Signalling Processor (MISP) for QSIG Path Replacement service. This pertains to ISDN BRI trunk applications.

Feature interactions

Attendant Console

Path replacement calls invoked by an attendant are not supported.

Attendant Barge In Attendant Break In

The Attendant Barge In and Attendant Break In features are not supported during path replacement operation.

Automatic Call Distribution

ISDN QSIG Path Replacement calls placed in an Automatic Call Distribution (ACD) queue are initially rejected. Path replacements requests are accepted after the call is answered by an ACD agent.

Call Transfer

When a local is transferred by the Meridian 1 during an ISDN QSIG Path Replacement request, then the replacement request is terminated. After Call Transfer, the Meridian 1 may accept path replacement from another PINX. QSIG Call Transfer is not supported at this time.

Call Hold

Path Replacement cannot be invoked on a held call. Path replacement is only accepted on an active call.

Conference Calls

The Meridian 1 does not invoke path replacement when callers are involved in an established conference. Any replacement requests from a far end PINX are rejected when a call is on an established conference.

Customer Controlled Routing

Following a Customer Controlled rerouting, path replacement is only invoked by the connected number trigger.

Direct Inward System Access

Path replacement does not occur on a Direct Inward System Access (DISA) call. The Meridian 1 does not invoke the Path Replacement feature on DISA calls.

Music
Radio Paging
Recorded Announcement

The Meridian 1 does not invoke the Path Replacement feature on Music, Paged or Recorded Announcement calls.

Feature packaging

The following packages are required for ISDN QSIG Path Replacement:

- QSIG Supplementary Services (QSIG-SS) package 316
- QSIG-GF Transport (QSIGGF) package 305
- QSIG Interface (QSIG) package 263
- Network Alternate Route Selection (NARS) package 58 (for Uniform Dialing Plan), or Coordinated Dialing Plan (CDP) package 59

On a 1.5 Mbps PRI interface the following packages are required:

- Integrated Services Digital Network (ISDN) package 145
- ISDN Primary Rate Access (PRA) Central Office package 146
- Multipurpose Serial Data Link (MSDL) package 222

Feature Implementation

LD 15 – Configure Private Integrated Services Network Exchange Directory Number.

Prompt	Response	Description
REQ:	CHG	Change existing data.
TYPE:	NET	Networking.
CUST	xx	Customer number.
...		
ISDN	YES	Integrated Services Digital Network.
...		
- PINX_DN	xx...x	Private Integrated Services Network Exchange Directory Number, up to seven digits.

LD 16 – Configure New Path Replacement parameters for a QSIG ISGF interface.

Prompt	Response	Description
REQ	CHG NEW	Change existing data. Add new data.
TYPE	RDB	Route Data Block.
CUST	xx	Customer number.
ROUT	0 - 511 0-127	Route Number. For Option 11C.
...		
DTRK	YES	Digital Trunk Type.
- DGTP	PRI	PRI trunk.
- IFC	ISGF	QSIG Interface ID for ISO with GF capability.
...		

RCAP	PRI PRO	Add Path Replacement as a remote capability. PRI = The encoding method uses Integer values. PRO = The encoding method uses Object Identifier. PRI and PRO are mutually exclusive, and cannot be configured together at the same time on the same link. Precede PRI and PRO with X to remove. The previously configured PR parameters will be valid, if PR is deactivated and then reactivated.
...		
PR_TRIGS	<CR>	Path Replacement Triggers. <CR> = If REQ = NEW, the parameters are set to the default values, which are: DIV 2 3 (two PR attempts, with a three minute delay for Diversion triggers) CNG 2 3 (two PR attempts, with a three minute delay for Congestion triggers) XCON (Connected Number is not a trigger). If REQ = CHG, the Path Replacement parameters are not modified.
	DIV xx-y CNG xx-y CON xx-y	DIV = Diversion is used to trigger Path Replacement. CNG = Congestion is used to trigger Path Replacement. A Connected number different from a called number is used to trigger Path Replacement. where: xx = 0-(2)-15, the number of Path Replacement attempts (the default is two). If 0 is entered, the number will be set to infinite. yy = 1-(3)-7, the delay, in minutes, between two consecutive Path Replacement attempts (the default is three minutes). Precede DIV, CNG, and CON with X to remove the Path Replacement trigger.
PR_RTN	YES (NO)	Retain option is (is not) supported by the far end PINX.
...		

LD 17 – Configure QSIG Path Replacement for a QSIG ISGF interface.

Prompt	Response	Description
REQ	CHG	Change existing data.
TYPE	CFN	Configuration Record.
ADAN	CHG DCH X	Change D-Channel number.
...		
- IFC	ISGF	QSIG Interface ID for ISO with GF capability.
...		
- RCAP	aaa	Add Path Replacement as remote capability where: PRI = Integer values as encoding method. PRO = Object identifier as encoding method. Precede with X to remove.
...		
PR_TRIGS	<CR>	Path Replacement Triggers. <CR> = If REQ = NEW, the parameters are set to the default values, which are: DIV 2 3 (two PR attempts, with a three minute delay for Diversion triggers) CNG 2 3 (two PR attempts, with a three minute delay for Congestion triggers) XCON (Connected Number is not a trigger). If REQ = CHG, the Path Replacement parameters are not modified.
	DIV xx-y CNG xx-y CON xx-y	DIV = Diversion is used to trigger Path Replacement. CNG = Congestion is used to trigger Path Replacement. CON = A Connected number different from a called number is used to trigger Path Replacement. where: xx = 0-(2)-15, the number of Path Replacement attempts (the default is two). If 0 is entered, the number will be set to infinite. yy = 1-(3)-7, the delay, in minutes, between two consecutive Path Replacement attempts (the default is three minutes).
PR_RTN	YES (NO)	Retain option is (is not) supported by the far end PINX.

Feature operation

No specific operating procedures are required to use this feature.